Appendix 3B. Water-quality benchmarks for pesticide compounds analyzed in NAWQA bed-sediment and (or) whole-fish samples

[For pesticide compounds in bed sediment and whole-fish tissue, benchmarks are for protection of aquatic life and fish-eating wildlife, respectively. Common synonyms are listed in parentheses in column 1. Cited references are listed in Appendix 3D. $Benchmark_{High}$, highest value in the range of wildlife benchmarks available for a given pesticide compound or group; $Benchmark_{Low}$, lowest value in the range of wildlife benchmarks available for a given pesticide compound or group; C_f, concentration in food; Eisler-PC, proposed criterion from Contaminant Hazard Review series by R. Eisler and colleagues; ESB, equilibrium partitioning sediment benchmark; FFC, fish flesh criterion (noncancer value); NOAEL-ECF, no-observed-adverse-effects level equivalent concentration in food; TEC, threshold effect concentration; TRG, tissue residue guideline; USEPA, U.S. Environmental Protection Agency; µg/g, microgram per gram; µg/kg dw, microgram per kilogram dry weight; µg/kg ww, microgram per kilogram wet weight;—, no benchmark available.]

Pesticide compound (synonym)	Bed sediment benchmarks for protection of benthic aquatic organisms		Whole-fish benchmarks for protection of fish-eating wildlife			
	Consensus-based threshold effect concentration (TEC) (µg/kg dw) [1]	USEPA equilibrium partitioning sediment benchmark (ESB) (µg/g of sediment organic carbon) [1]	$Benchmark_{Low}$ value (µg/kg ww) [2]	Type of $Benchmark_{Low}$	$Benchmark_{High}$ value (µg/kg ww) [2]	Type of $Benchmark_{High}$
Organochlorines						
Aldrin	—	—	813	NOAEL-equivalent concentration in food	813	NOAEL-equivalent concentration in food
Total chlordane [3]	3.24	—	300	Eisler proposed criterion	4,200	NOAEL-equivalent concentration in food
o,p´ + *p,p´*-DDD [4]	4.88	—	see ([5])	—	see ([5])	—
o,p´ + *p,p´*-DDE [4]	3.16	—	see ([5])	—	see ([5])	—
o,p´ + *p,p´*-DDT [4]	4.16	—	see ([5])	—	see ([5])	—
Total DDT [5]	5.28	—	6	NOAEL-equivalent concentration in food	200	New York FFC
Dieldrin	1.90	12	81	NOAEL-equivalent concentration in food	[6] 120	New York FFC
Endosulfan I	—	0.29	—	—	—	—
Endrin	2.22	5.4	20	NOAEL-equivalent concentration in food	25	New York FFC
beta-HCH	—	—	1,630	NOAEL-equivalent concentration in food	1,630	NOAEL-equivalent concentration in food
gamma-HCH	2.37	0.37	3,950	NOAEL-equivalent concentration in food	3,950	NOAEL-equivalent concentration in food
Total HCH [7]	—	—	70	NOAEL-equivalent concentration in food	100	New York FFC
Heptachlor	—	—	529	NOAEL-equivalent concentration in food	529	NOAEL-equivalent concentration in food

Appendix 3B. Water-quality benchmarks for pesticide compounds analyzed in NAWQA bed-sediment and (or) whole-fish samples

[For pesticide compounds in bed sediment and whole-fish tissue, benchmarks are for protection of aquatic life and fish-eating wildlife, respectively. Common synonyms are listed in parentheses in column 1. Cited references are listed in Appendix 3D. $Benchmark_{High}$, highest value in the range of wildlife benchmarks available for a given pesticide compound or group; $Benchmark_{Low}$, lowest value in the range of wildlife benchmarks available for a given pesticide compound or group; C_f, concentration in food; Eisler-PC, proposed criterion from Contaminant Hazard Review series by R. Eisler and colleagues; ESB, equilibrium partitioning sediment benchmark; FFC, fish flesh criterion (noncancer value); NOAEL-ECF, no-observed-adverse-effects level equivalent concentration in food; TEC, threshold effect concentration; TRG, tissue residue guideline; USEPA, U.S. Environmental Protection Agency; µg/g, microgram per gram; µg/kg dw, microgram per kilogram dry weight; µg/kg ww, microgram per kilogram wet weight;—, no benchmark available.]

Pesticide compound (synonym)	Bed sediment benchmarks for protection of benthic aquatic organisms		Whole-fish benchmarks for protection of fish-eating wildlife			
	Consensus-based threshold effect concentration (TEC) (µg/kg dw) [1]	USEPA equilibrium partitioning sediment benchmark (ESB) (µg/g of sediment organic carbon) [1]	$Benchmark_{Low}$ value (µg/kg ww) [2]	Type of $Benchmark_{Low}$	$Benchmark_{High}$ value (µg/kg ww) [2]	Type of $Benchmark_{High}$
Heptachlor epoxide	2.47	—	see ([8])	—	see ([8])	—
Total heptachlor [8]	—	—	200	New York FFC	529	NOAEL-equivalent concentration in food
Hexachlorobenzene	—	—	330	New York FFC	330	New York FFC
Total methoxychlor [9]	—	1.9	16,300	NOAEL-equivalent concentration in food	16,300	NOAEL-equivalent concentration in food
Mirex	—	—	330	New York FFC	330	New York FFC
Toxaphene	—	10	6.3	Canadian TRG	32,500	NOAEL-equivalent concentration in food

[1] TECs are from MacDonald and others (2000). ESBs are from USEPA (2003g, 2003h, 2003i).

[2] $Benchmark_{Low}$ and $Benchmark_{High}$ refer to the range of benchmark values from the following four sources: Oak Ridge NOAEL-equivalent concentrations in food (the lowest C_f value for piscivorous wildlife species from Sample and others, 1996); New York fish flesh criteria—noncancer values (Newell and others, 1987); Canadian tissue residue guidelines (Canadian Council of Ministers of the Environment, 1999a, 1999b); proposed criteria from the U.S. Fish and Wildlife Service's report series, Contaminant Hazard Reviews (Eisler and Jacknow, 1985; Eisler 1990).

[3] Sum of *cis* - and *trans* -chlordane, *cis* - and *trans* -nonachlor, and oxychlordane.

[4] Benchmark applies to the sum of these two compounds

[5] Sum of the concentrations of *o,p´* and *p,p´* isomers of DDD, DDE, and DDT.

[6] The benchmark is for total dieldrin (sum of aldrin plus dieldrin). However, this benchmark is considered applicable to dieldrin concentration data because only one fish sample contained any aldrin (10 µg/kg), and in that sample both aldrin and dieldrin (43 µg/kg) were well below all benchmarks.

[7] Sum of the concentrations of *alpha* , *beta* , *gamma* , and *delta* -HCH.

[8] Sum of the concentrations of heptachlor and heptachlor epoxide.

[9] Sum of the concentrations of *o,p´* and *p,p´* isomers of methoxychlor.